Large-Scale Ozone, Aerosol, and Cloud Measurements During INTEX-NA/ICARTT

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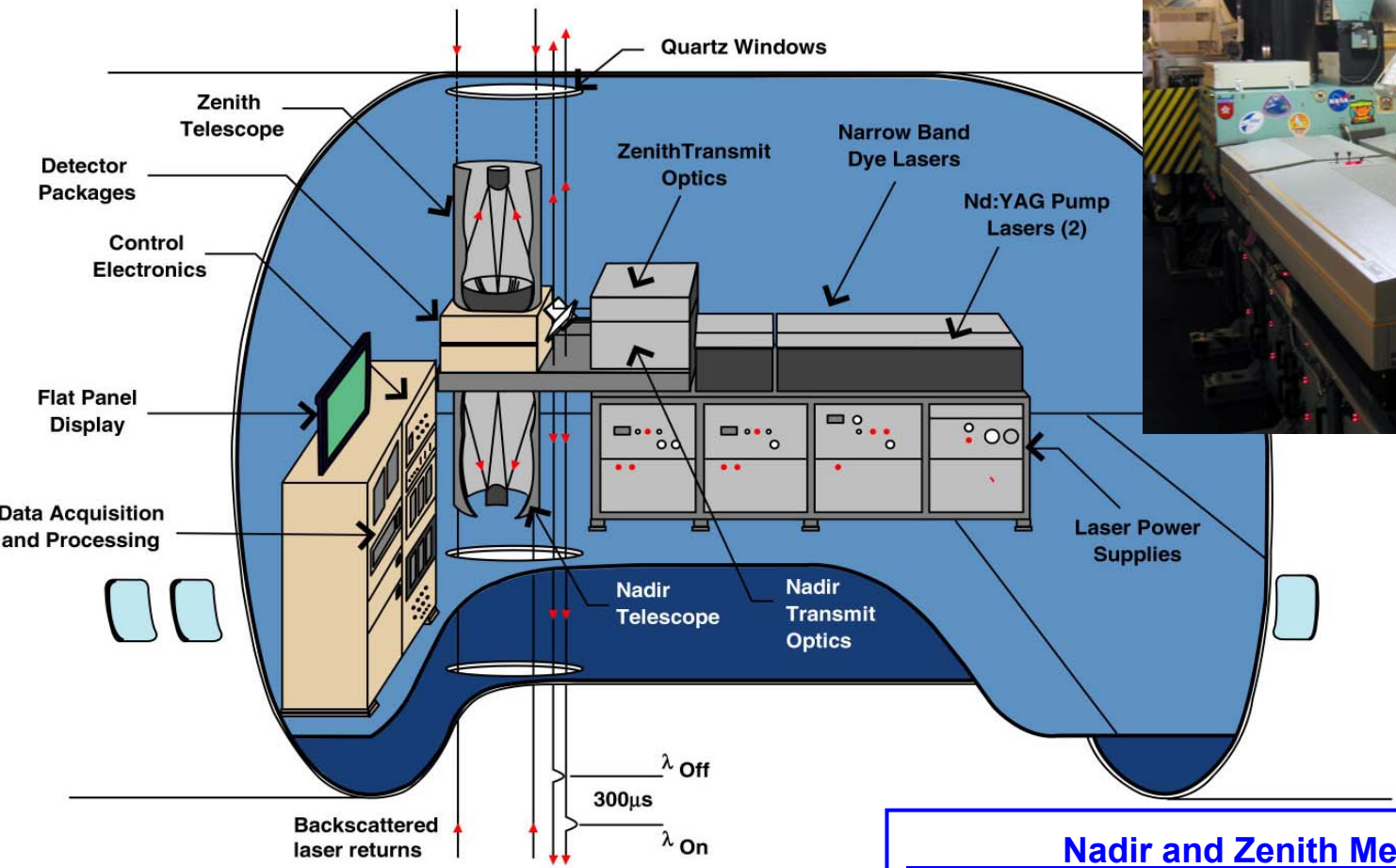
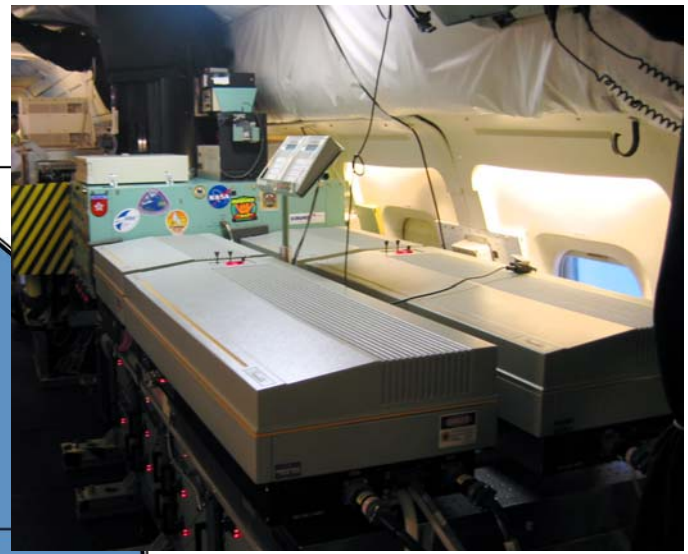
Airborne Ozone & Aerosol Lidar Measurements

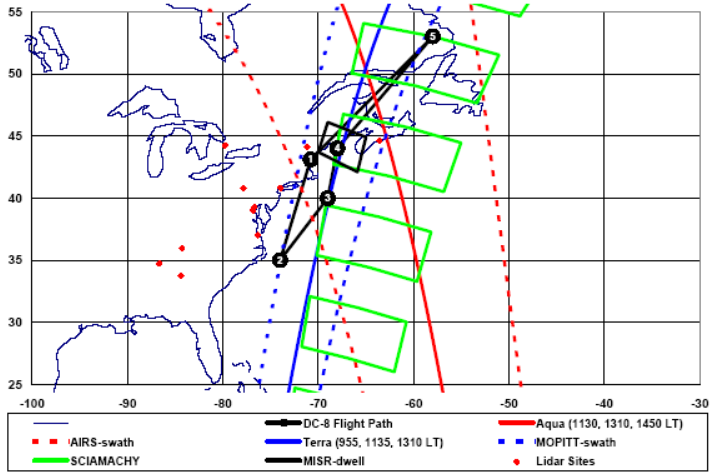




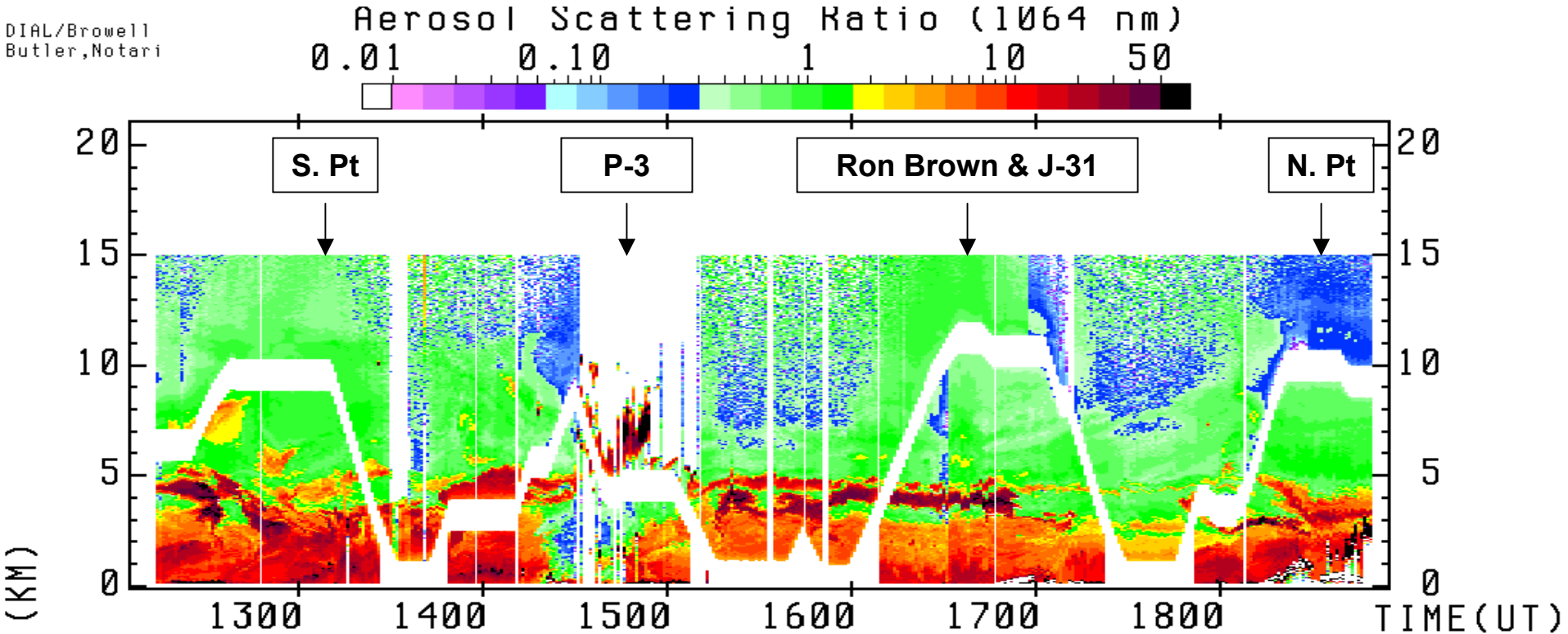
Nadir and Zenith Measurements

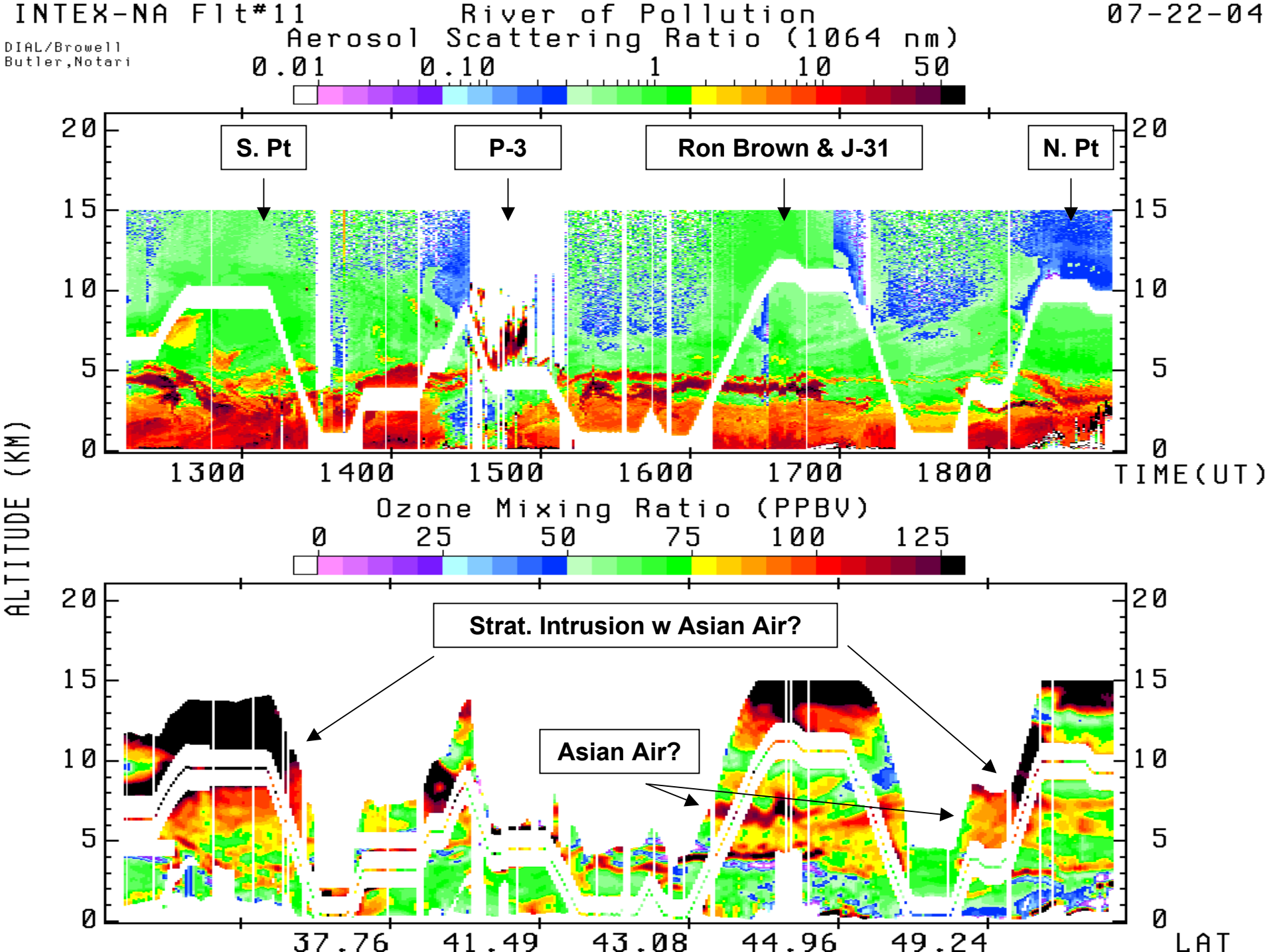
- Ozone Profiles (λ_{ON} = 289 nm & λ_{OFF} = 300 nm)
- Aerosol Backscatter Ratios Profiles (1064, 600, 300 nm)
- Aerosol Depolarization Ratio Profiles (600 nm)

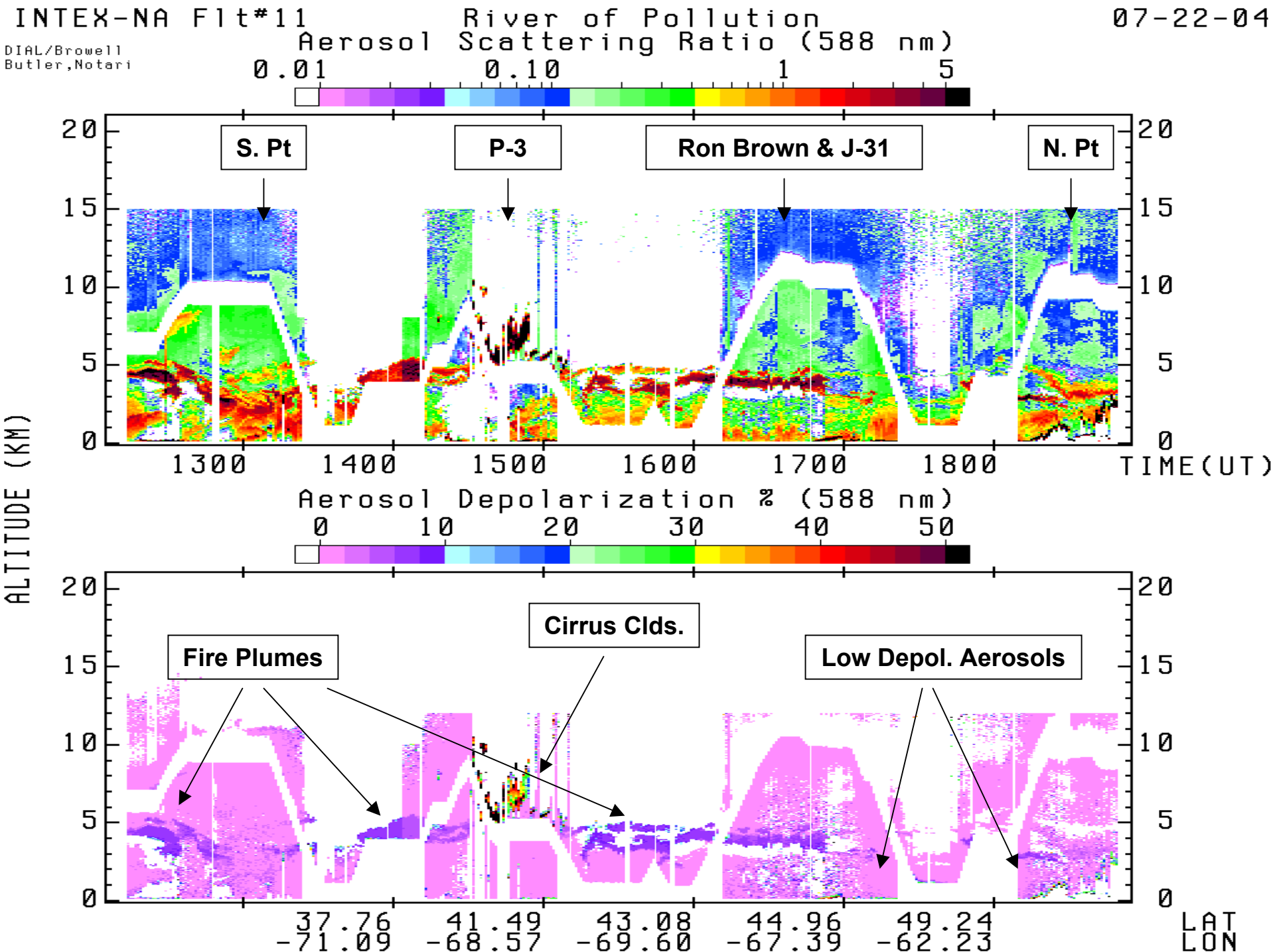
22 July 2004 (Flight #11) River of Pollution



DIAL/Browell
Butler,Notari

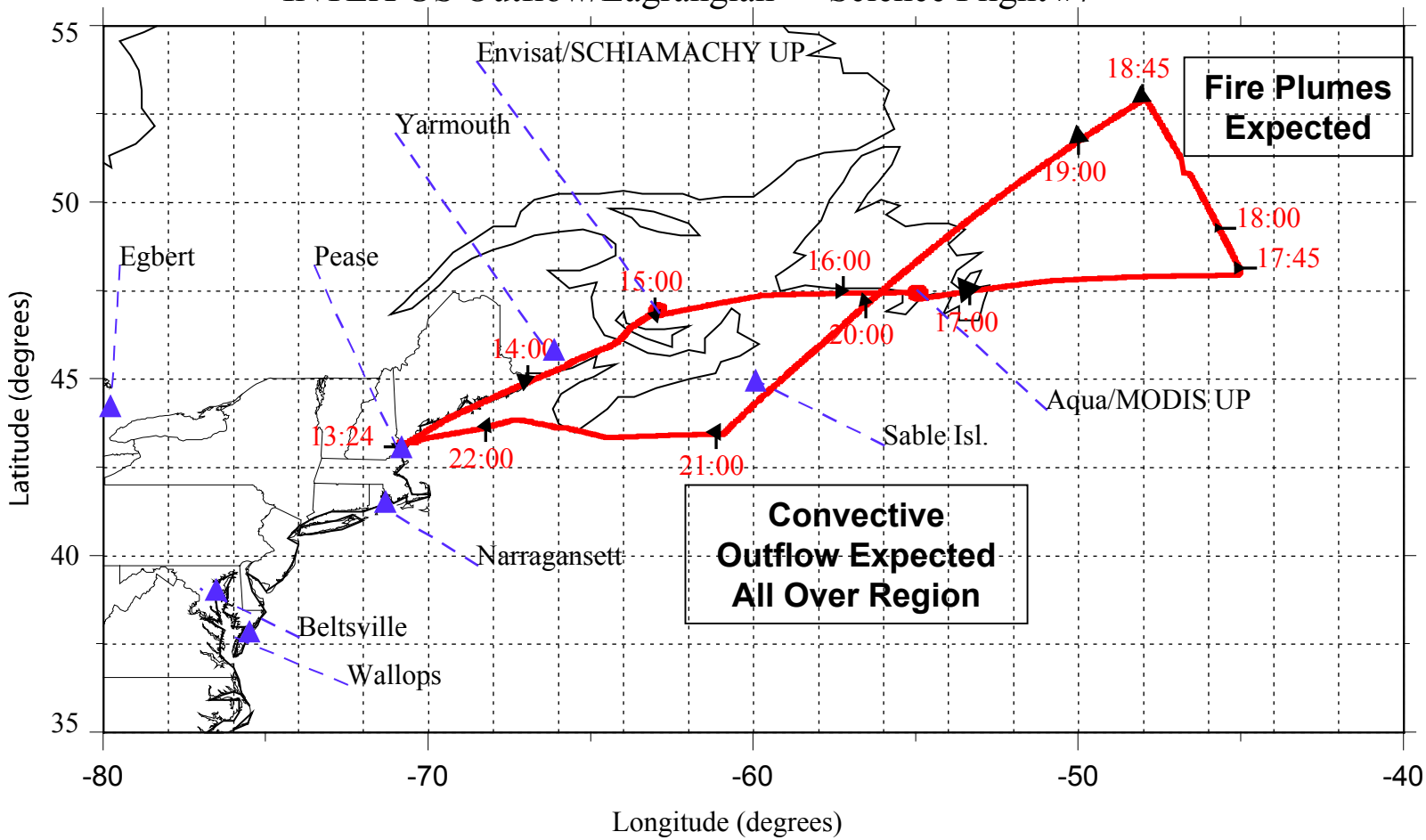



INTEX-NA Flt#11
River of Pollution
07-22-04
DIAL/Browell
Butler,Notari
Aerosol Scattering Ratio (1064 nm)
0.01
0.10
1
10
50
S. Pt
P-3
Ron Brown & J-31
N. Pt
20
15
10
5
0
1300
1400
1500
1600
1700
1800
TIME(UT)
ALTITUDE (KM)
Ozone Mixing Ratio (PPBV)
0
25
50
75
100
125
Strat. Intrusion w Asian Air?
Asian Air?
37.76
41.49
43.08
44.96
49.24
LAT

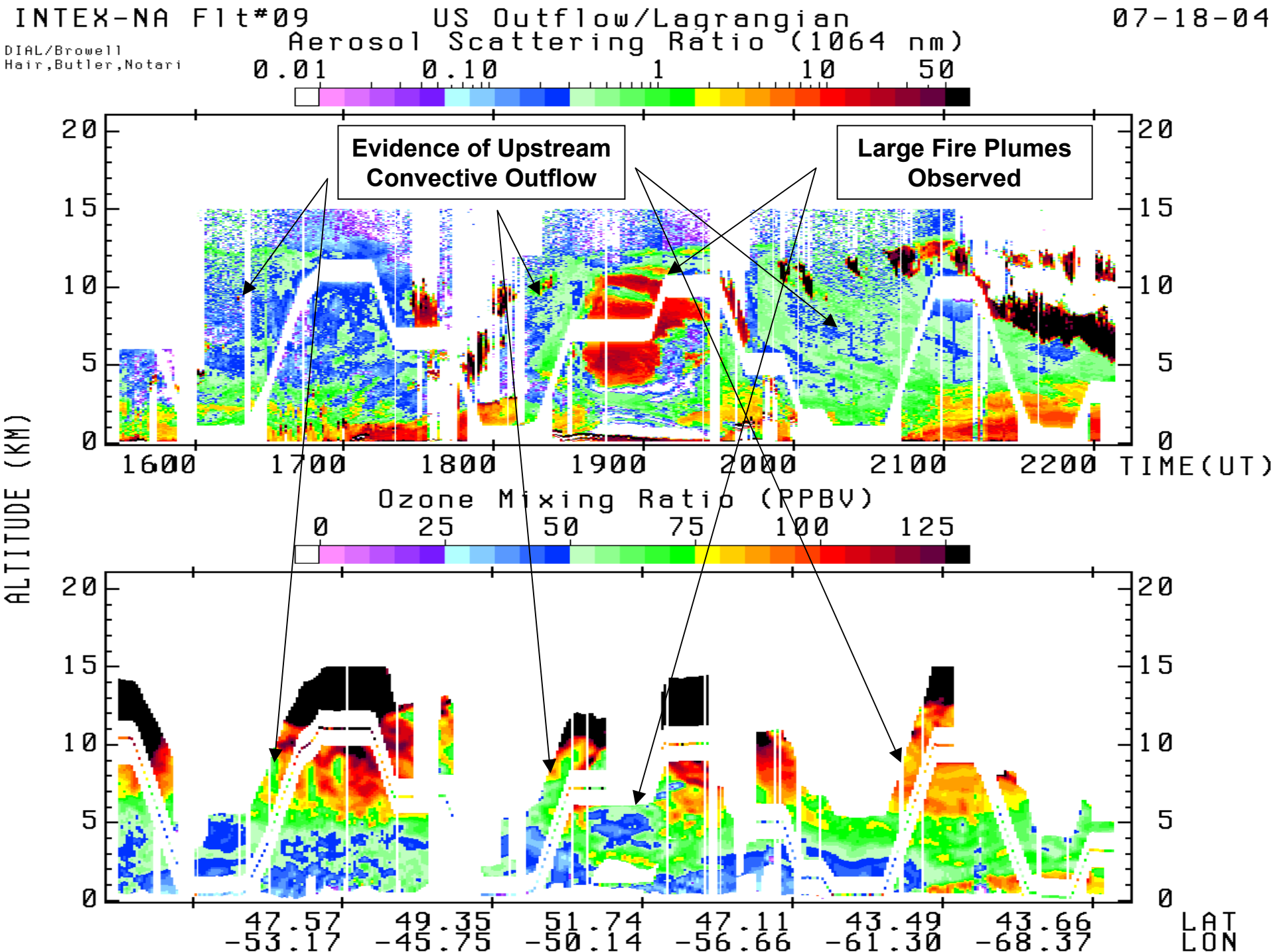

INTEX-NA Flt#11
River of Pollution
07-22-04
DIAL/Browell
Butler,Notari
Aerosol Scattering Ratio (588 nm)
0.01
0.10
1
5
S. Pt
P-3
Ron Brown & J-31
N. Pt
ALTITUDE (KM)
TIME(UT)
1300
1400
1500
1600
1700
1800
Aerosol Depolarization % (588 nm)
0
10
20
30
40
50
Fire Plumes
Cirrus Clds.
Low Depol. Aerosols
37.76
41.49
43.08
44.96
49.24
-71.09
-68.57
-69.60
-67.39
-62.23
LAT
LON

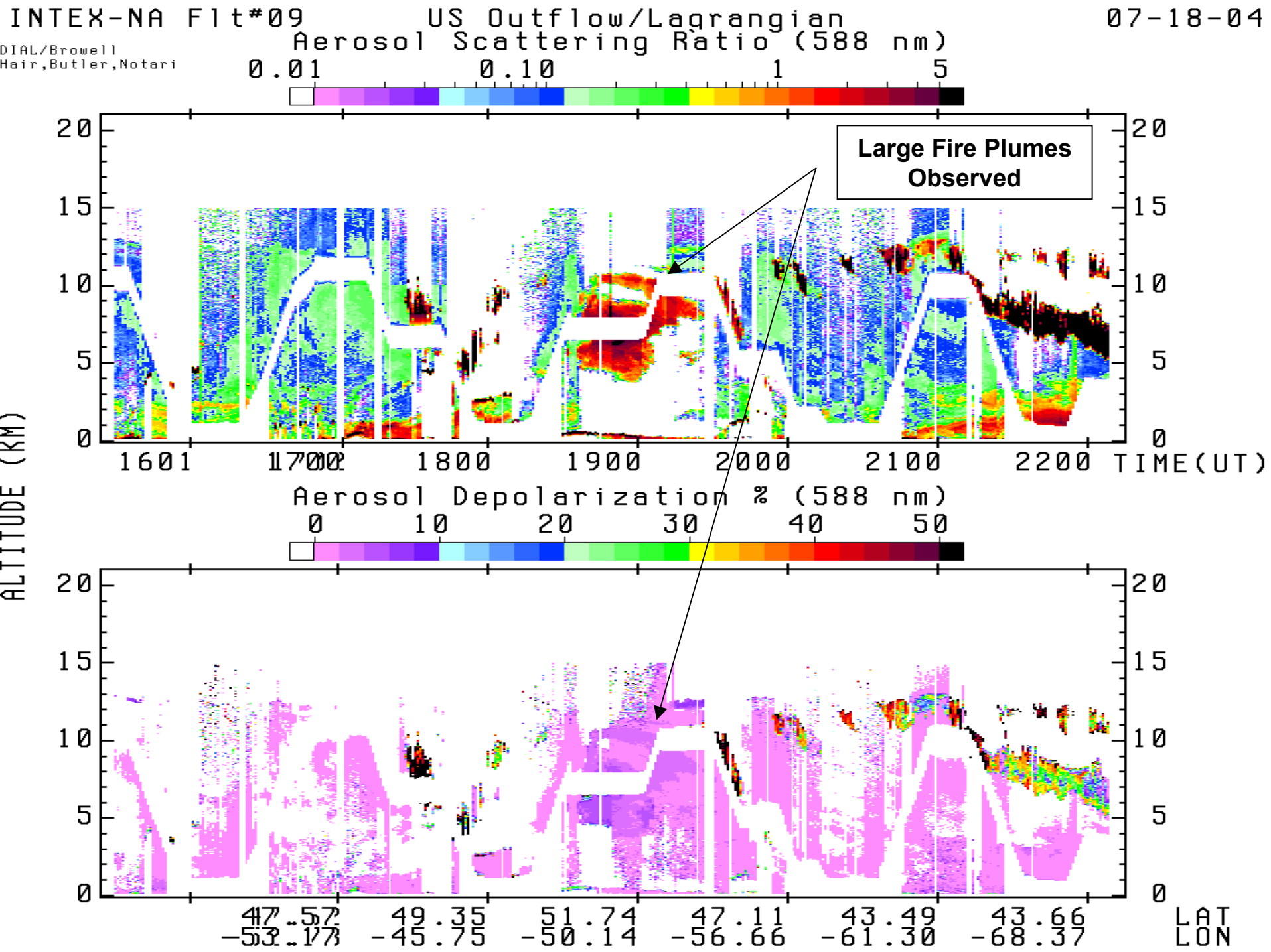
DIAL DC-8 Track (Flight 09) July 18, 2004

INTEX US Outflow/Lagrangian -- Science Flight #7



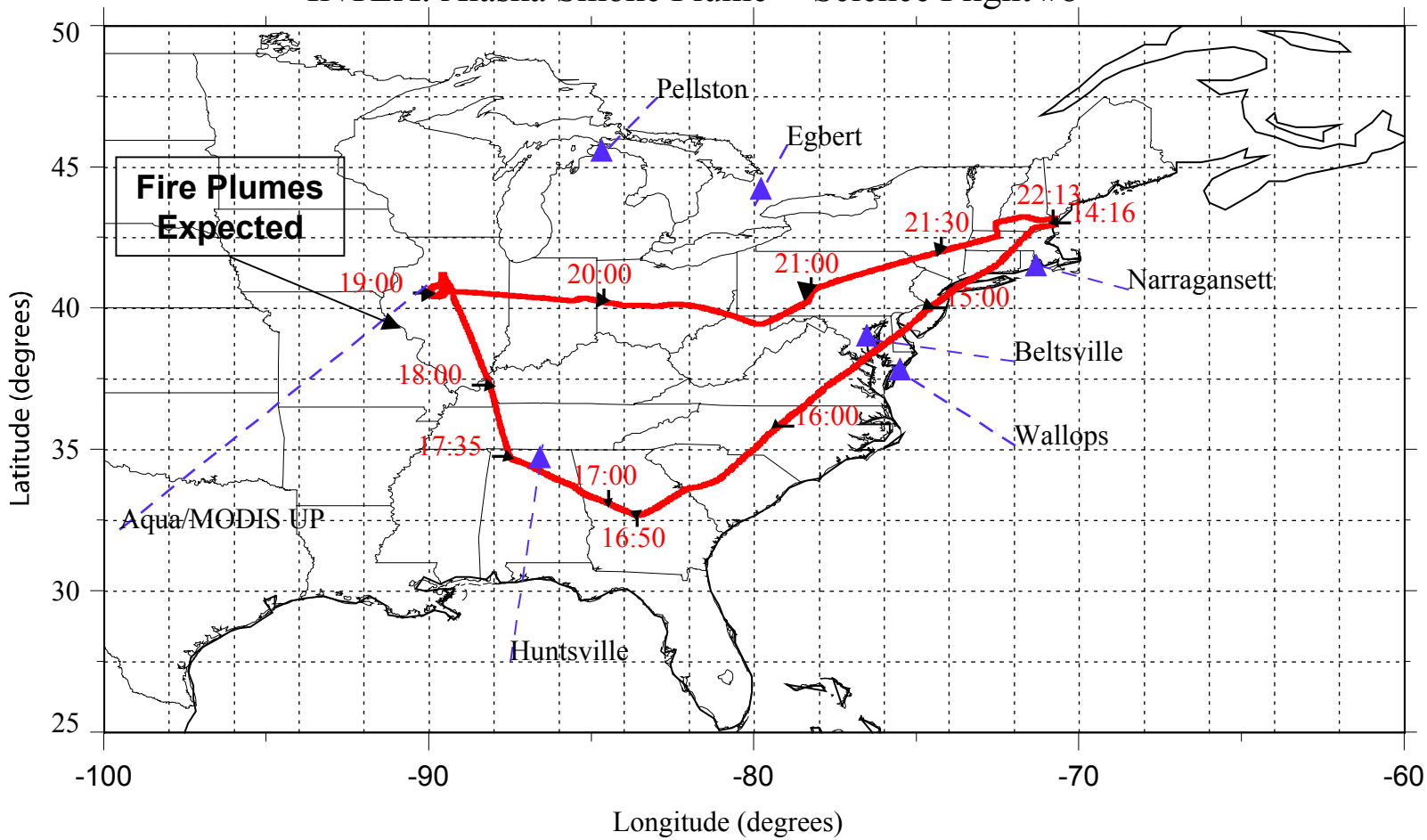
(19Jul04VGB)


INTEX-NA Flt#09
US Outflow/Lagrangian
07-18-04
DIAL/Browell
Hair,Butler,Notari
Aerosol Scattering Ratio (1064 nm)
0.01
0.10
1
10
50
Evidence of Upstream Convective Outflow
Large Fire Plumes Observed
ALTITUDE (KM)
20
15
10
5
0
1600
1700
1800
1900
2000
2100
2200
TIME(UT)
Ozone Mixing Ratio (PPBV)
0
25
50
75
100
125
47.57
-53.17
49.35
-45.75
51.74
-50.14
47.11
-56.66
43.49
-61.30
43.66
-68.37
LAT
LON

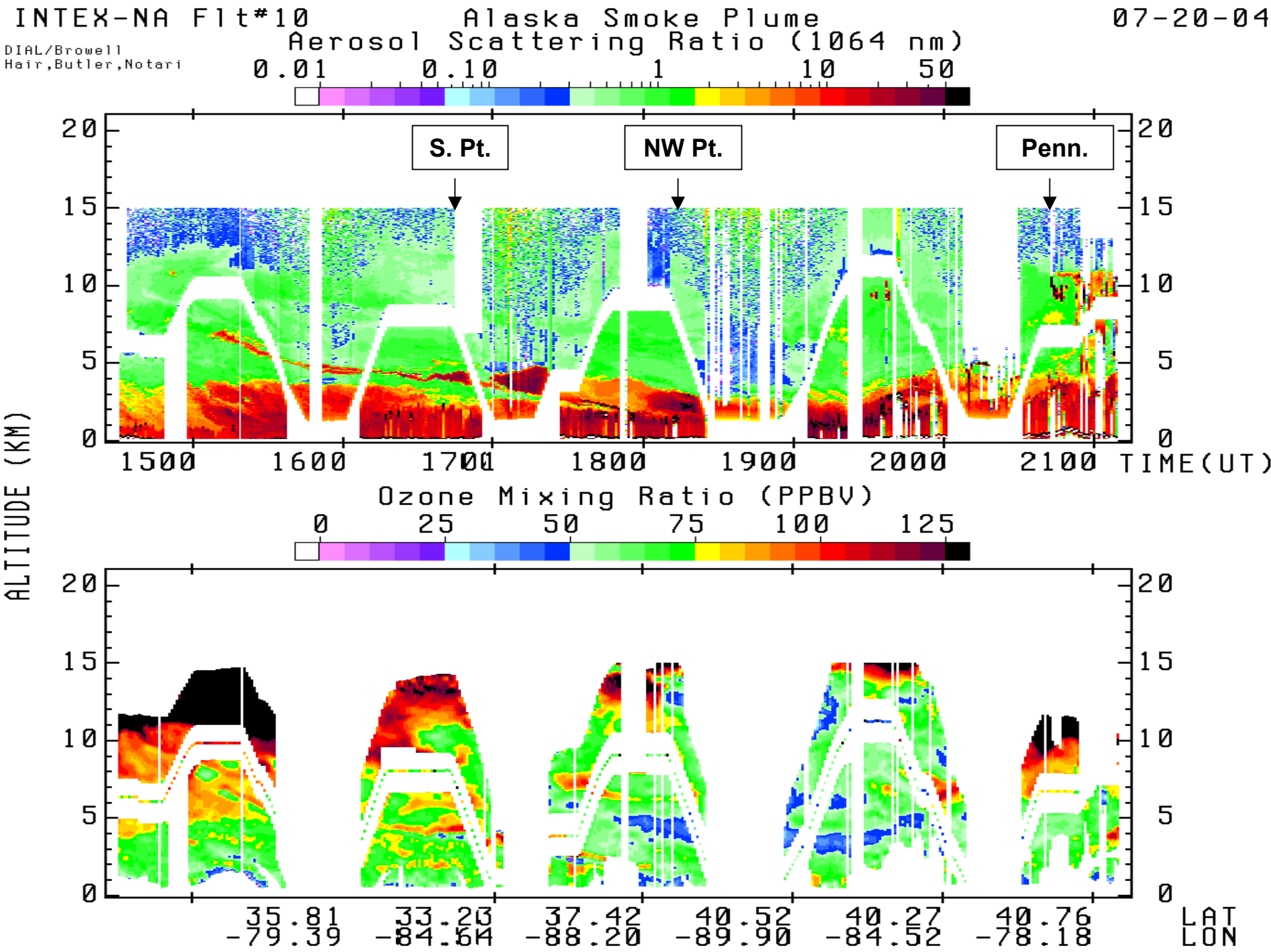

INTEX-NA Flt#09
US Outflow/Lagrangian
07-18-04
DIAL/Browell
Hair,Butler,Notari
Aerosol Scattering Ratio (588 nm)
0.01
0.10
1
5
Large Fire Plumes Observed
ALTITUDE (KM)
20
15
10
5
0
1601
1700
1800
1900
2000
2100
2200
TIME(UT)
Aerosol Depolarization % (588 nm)
0
10
20
30
40
50
47.57
49.35
51.74
47.11
43.49
43.66
LAT
-53.17
-45.75
-50.14
-56.66
-61.30
-68.37
LON

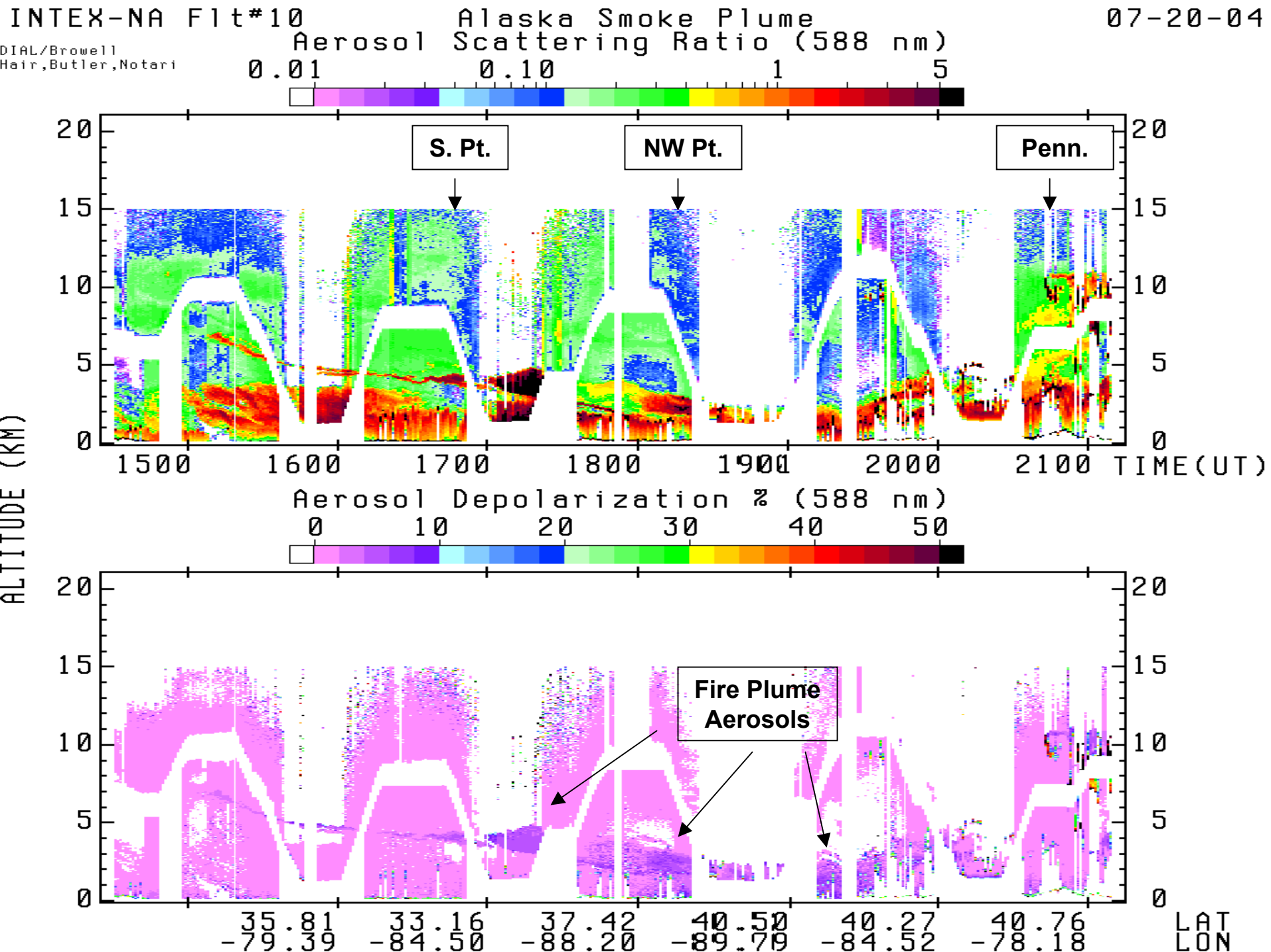
DIAL DC-8 Track (Flight 10) July 20, 2004

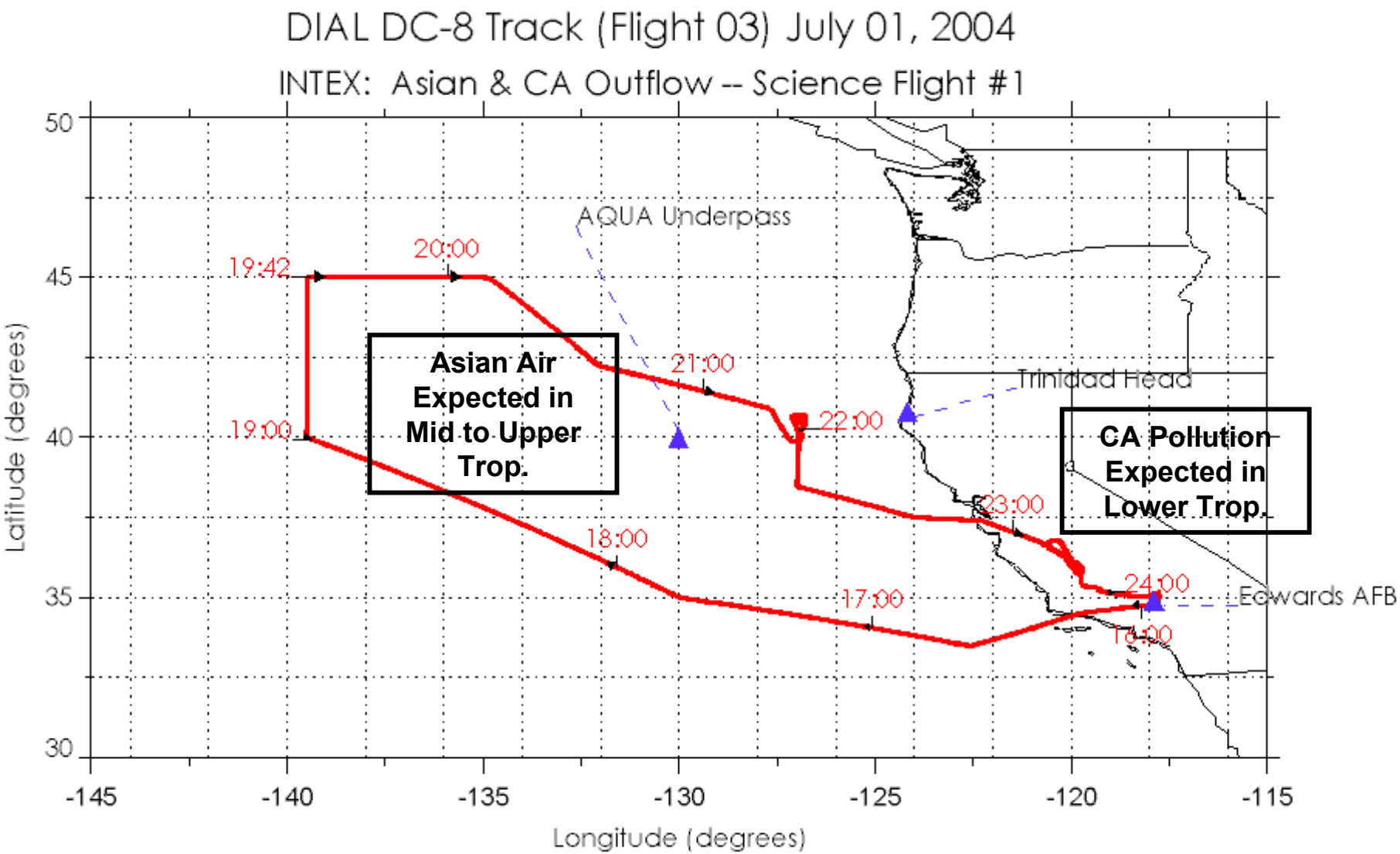
INTEX: Alaska Smoke Plume -- Science Flight #8

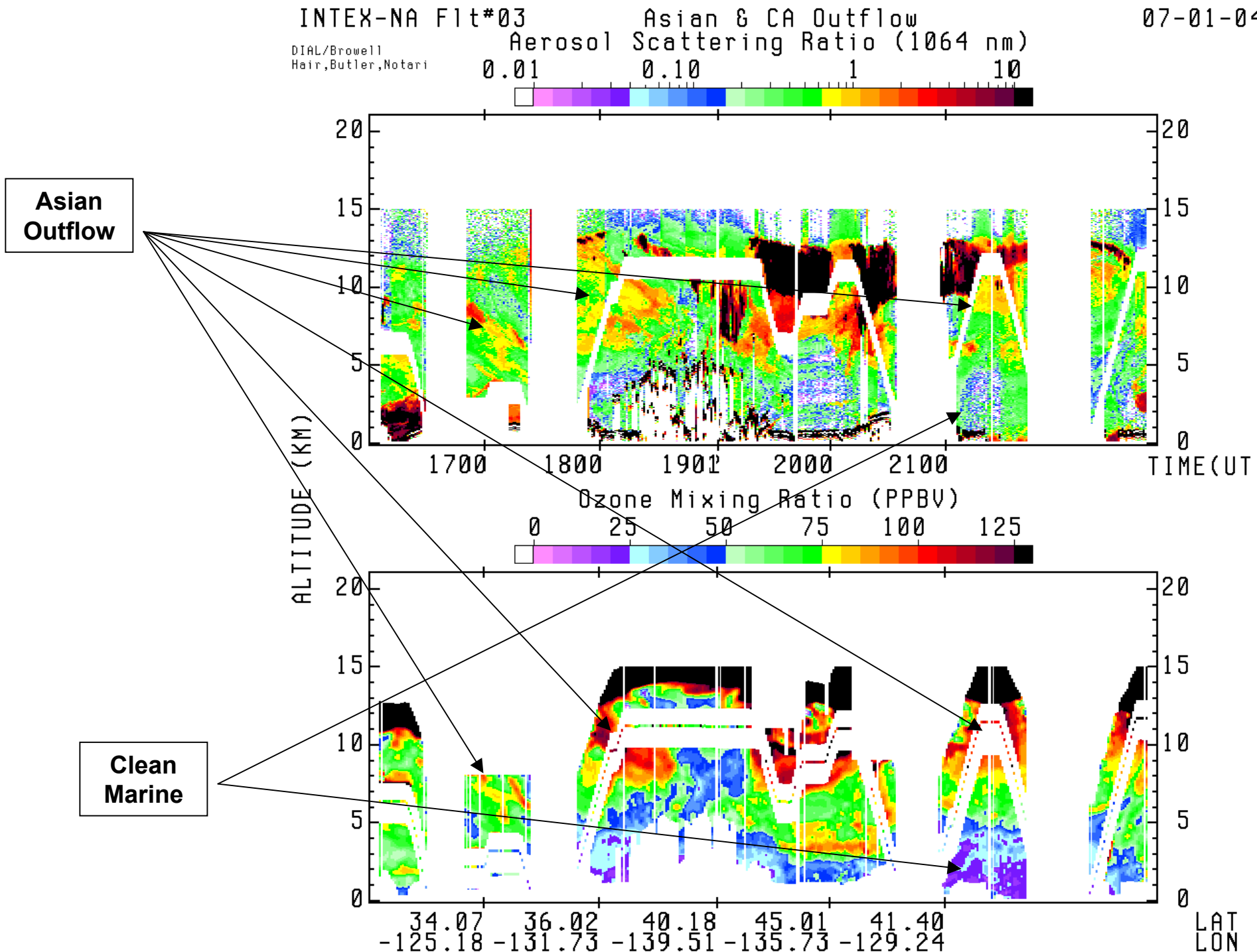


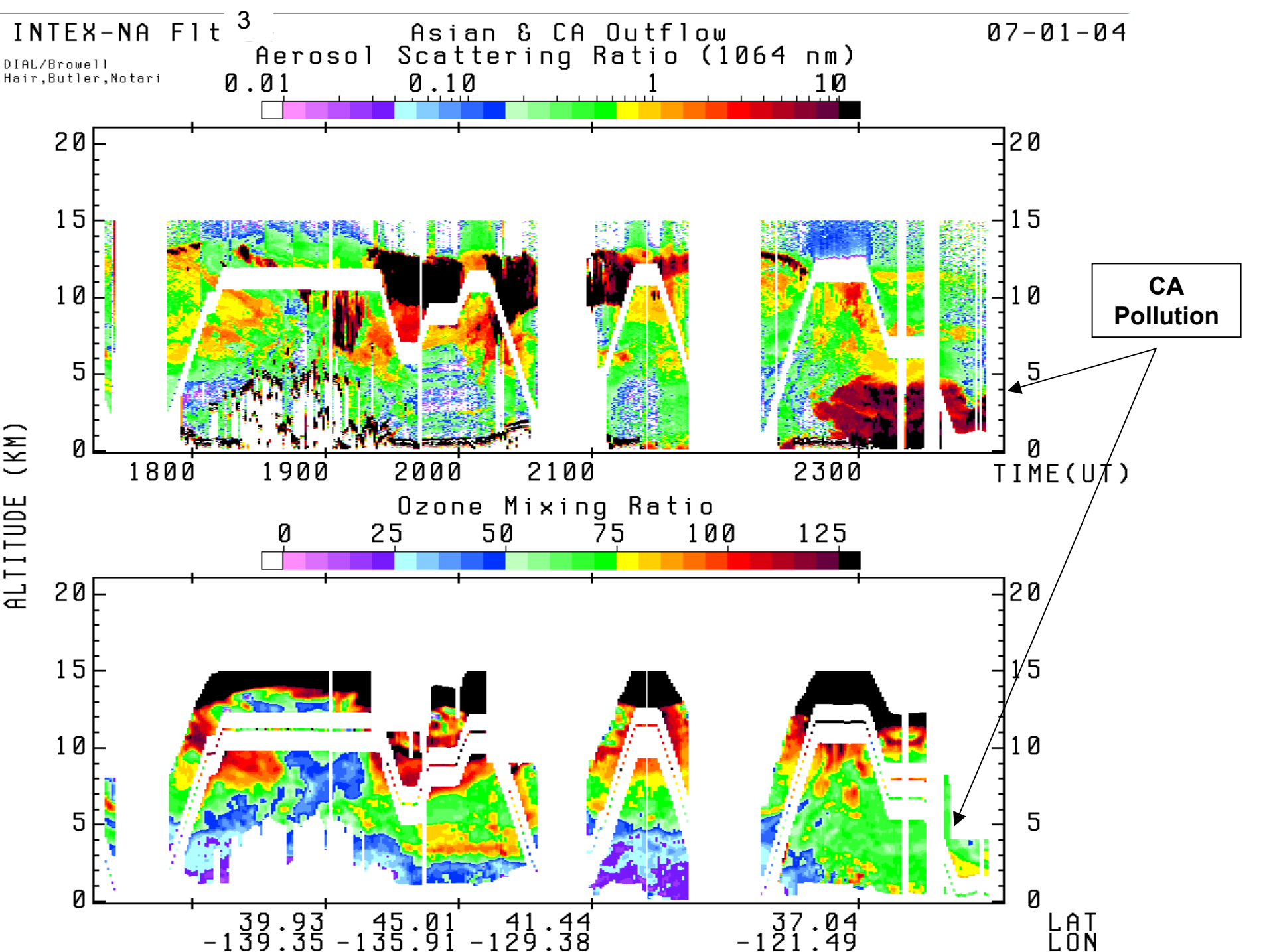
(21Jul04VGB)


INTEX-NA Flt#10
Alaska Smoke Plume
07-20-04
DIAL/Browell
Hair,Butler,Notari
Aerosol Scattering Ratio (1064 nm)
0.01
0.10
1
10
50
S. Pt.
NW Pt.
Penn.
ALTITUDE (KM)
TIME(UT)
1500
1600
1700
1800
1900
2000
2100
Ozone Mixing Ratio (PPBV)
0
25
50
75
100
125
35.81
-79.39
33.20
-84.64
37.42
-88.20
40.52
-89.90
40.27
-84.52
40.76
-78.18
LAT
LON


INTEX-NA Flt#10
Alaska Smoke Plume
07-20-04
DIAL/Browell
Hair,Butler,Notari
Aerosol Scattering Ratio (588 nm)
0.01
0.10
1
5
S. Pt.
NW Pt.
Penn.
20
15
10
5
0
1500
1600
1700
1800
1900
2000
2100
TIME(UT)
ALTITUDE (KM)
Aerosol Depolarization % (588 nm)
0
10
20
30
40
50
Fire Plume
Aerosols
35.81
-79.39
33.16
-84.50
37.42
-88.20
40.50
-89.79
40.27
-84.52
40.76
-78.18
LAT
LON


DIAL DC-8 Track (Flight 03) July 01, 2004
INTEX: Asian & CA Outflow -- Science Flight #1
AQUA Underpass
Trinidad Head
Edwards AFB
19:42
20:00
21:00
22:00
23:00
24:00
19:00
18:00
17:00
16:00
Asian Air Expected in Mid to Upper Trop.
CA Pollution Expected in Lower Trop.
Latitude (degrees)
Longitude (degrees)
50
45
40
35
30
-145
-140
-135
-130
-125
-120
-115


INTEX-NA Flt#03
Asian & CA Outflow
07-01-04
DIAL/Browell
Hair,Butler,Notari
Aerosol Scattering Ratio (1064 nm)
0.01
0.10
1
10
Asian Outflow
ALTITUDE (KM)
TIME(UT
1700
1800
1901
2000
2100
Ozone Mixing Ratio (PPBV)
0
25
50
75
100
125
Clean Marine
34.07
36.02
40.18
45.01
41.40
LAT
-125.18
-131.73
-139.51
-135.73
-129.24
LON


INTEX-NA Flt 3
Asian & CA Outflow
07-01-04
DIAL/Browell
Hair,Butler,Notari
Aerosol Scattering Ratio (1064 nm)
0.01
0.10
1
10
ALTITUDE (KM)
TIME(UT)
1800
1900
2000
2100
2300
CA Pollution
Ozone Mixing Ratio
0
25
50
75
100
125
39.93
45.01
41.44
37.04
-139.35
-135.91
-129.38
-121.49
LAT
LON

Preliminary Results

- **Observed long-range transport of Asian pollution with enhanced aerosol and ozone distributions in mid to upper troposphere in the eastern Pacific to possibly over the eastern U.S. and the western Atlantic.**
- **Observed variable tropopause levels and presence of stratospheric intrusions which were mixed in many cases with polluted air masses from up wind convection.**
- **Observed high levels of aerosols and ozone associated with southern California and limited clean marine air over the eastern Pacific.**
- **Observed enhanced aerosols and ozone in lower troposphere associated with pollution over the U.S. and advection over the western Atlantic.**
- **Observed long-range transport of Alaskan fire plumes to mid, eastern, and northeastern U.S. in well defined layers which were observed to mix into the boundary layer in some cases.**
- **Just beginning the detailed interpretation of the many observed air masses in collaboration with the INTEX and ICARTT science team.**

Note: All INTEX data images available via http://asd-www.larc.nasa.gov/lidar/